OPERATING INSTRUCTIONS FOR

REMOTE ACTIVE VERTICAL ANTENNA,

MODEL RVA-25

SERIAL NO: 203

FAIRCHILD

ELECTRO-METRICS

CORPORATION

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Fairchild/Electro-Metrics Corporation
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TABLE OF CONTENTS

1.0 Introduction

2.0 Theory Of Operation

2.1 General

2.2 Read Mode

2.2.1 Low Band

2.2.2 High Band

2.3 Calibration Mode

2.3.1 Low Band

2.3.2 High Band

3.0 Operating Instructions

3.1 General

3.2 Physical Setup

3.3 Electrical Connections

3.4 Pre-operational check

3.5 Specifications

3.6 Electric Field Measurements

3.6.1 Narrow-band Radiated Signals

3.6.2 Broadband Radiated Signals

TEST PROCEDURE RVA-25

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TECHNICAL INFORMATION BULLETIN

TANGENTIAL SENSITIVITY

The following procedure is used to determine tangential sensitivity of the Remote Active Vertical Antenna Model RVA-25:

1. Remove dummy plug from EMC-25 and connect RVA-25 power cable.

2. Connect 25-foot RF cable "Sig. Out" on RVA-25 to "RF Input" on EMC-25.

3. EMC-25 front panel settings:

A.	RF Attenuator:	CAL position
B.	Bandwidth:	WIDE
C.	Audio:	CCW
D.	Dump:	CCW
E.	Slideback:	CCW
F.	Meter Function Switch:	Peak position
G.	Freq. Control:	To freq. desired.
H.	Tuning Mode:	Manual
I.	AFC:	OFF (Down)

4. Depress series CAL button on EMC-25 and set CAL control to some reference on EMC-25 meter (Noise).

5. Connect external IG (Empire Model IG-115 or equivalent) to "CAL IN" on RVA-25.

6. Adjust external IG output level until a "3 dB" rise above noise level is noted on the EMC-25 meter. This level is the broadband tangential sensitivity at the selected frequency.

7. For worst case sensitivities see Figure 3-2 in the RVA-25 instruction manual.

1.0 INTRODUCTION

This manual includes all relevant information for the successful operation of Remote Active Vertical Antenna, Model RVA-25, for use with Interference Analyzer EMC-25 or EMC-25R.

Fairchild/Electro-Metrics Remote Active Vertical Antenna, Model RVA-25, has been designed to provide for measurement of extremely low-level electric-field signals in the 14 kHz to 25 MHz frequency range when used in conjunction with the EMC-25 or EMC-25R Interference Analyzer (Bands #1-10).

2.0 THEORY OF OPERATION

2.1 GENERAL

Reference is directed to the functional block diagram Fig. 2-1 and the schematic diagram Fig. 2-2, in connection with the detailed discussion of the theory of operation.

The RVA-25 has two major modes of operation ("read" and "calibration") and two sub-modes ("low band and "high band"), all four modes being controlled by two binary logic inputs (Fig. 2-1 and 2-3) from the EMC-25 remote connector.

2.2 READ MODE

In the read mode the RVA-25 receives binary logic for either the low or high band from the band indicator switch A1A5S1AF, the low band being "0" and the high band "1", which is used to control relays K102, K103, and K104. A binary "0" voltage from the "Series Cal" switch A1S1 is also used for the control of K101 and K103. (Fig. 2.3)

2.2.1 READ MODE-LOW BAND

For the low band in the read mode, electric field signals intercepted by the 82" telescoping rod antenna are coupled to the source follower amplifier, Q_2 , a field-effect transistor, through de-energized relay K101. The high input impedance of the source follower stage provides optimum loading for the rod antenna in the 14 kHz - 2.4 MHz range (Band 1-7 on EMC-25). The signal is then directly coupled to the base of a silicon planar transistor amplifier, Q_1, which through an emitter follower, Q_9 , provides a low impedance output for coupling to the base of Q_{10} through

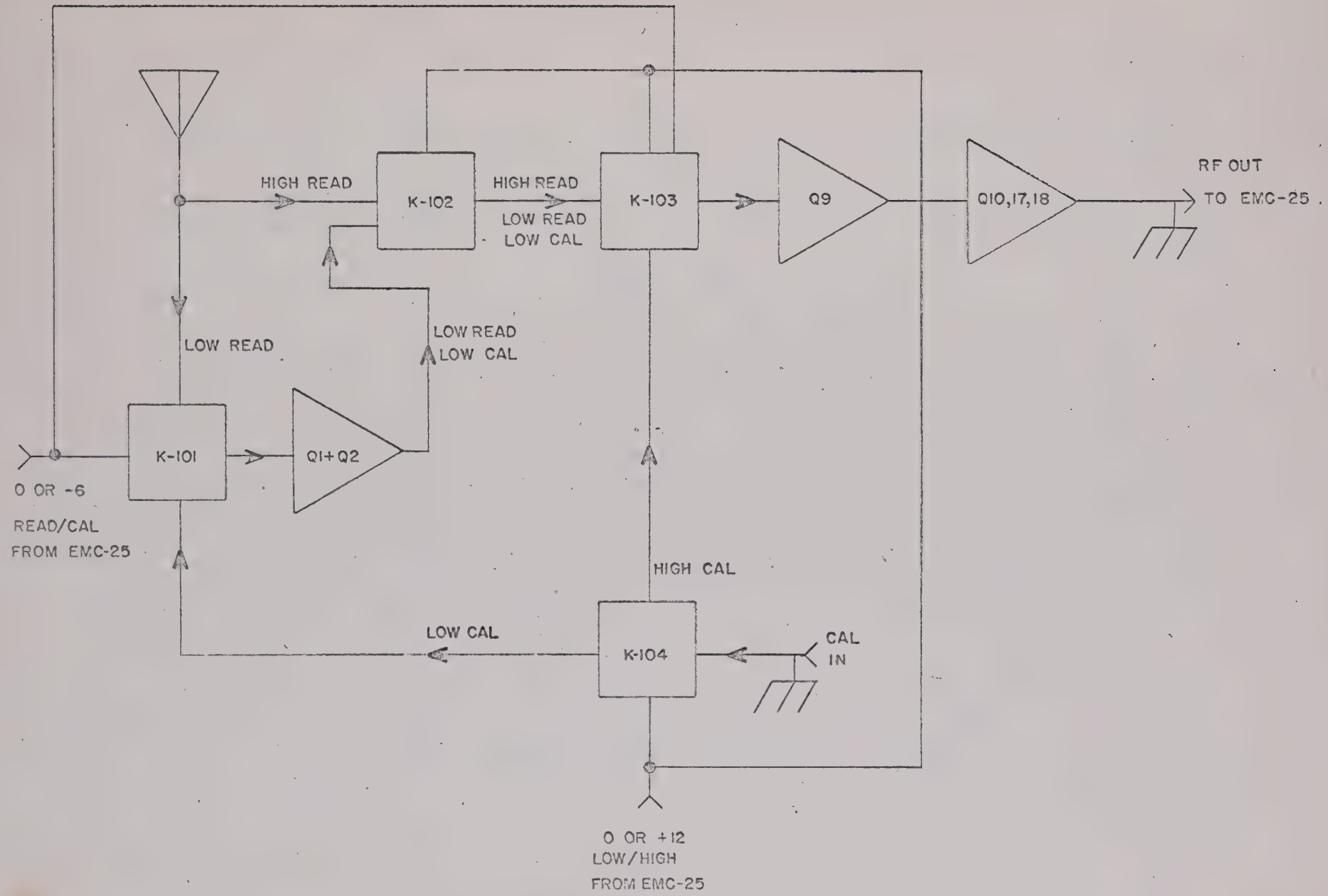
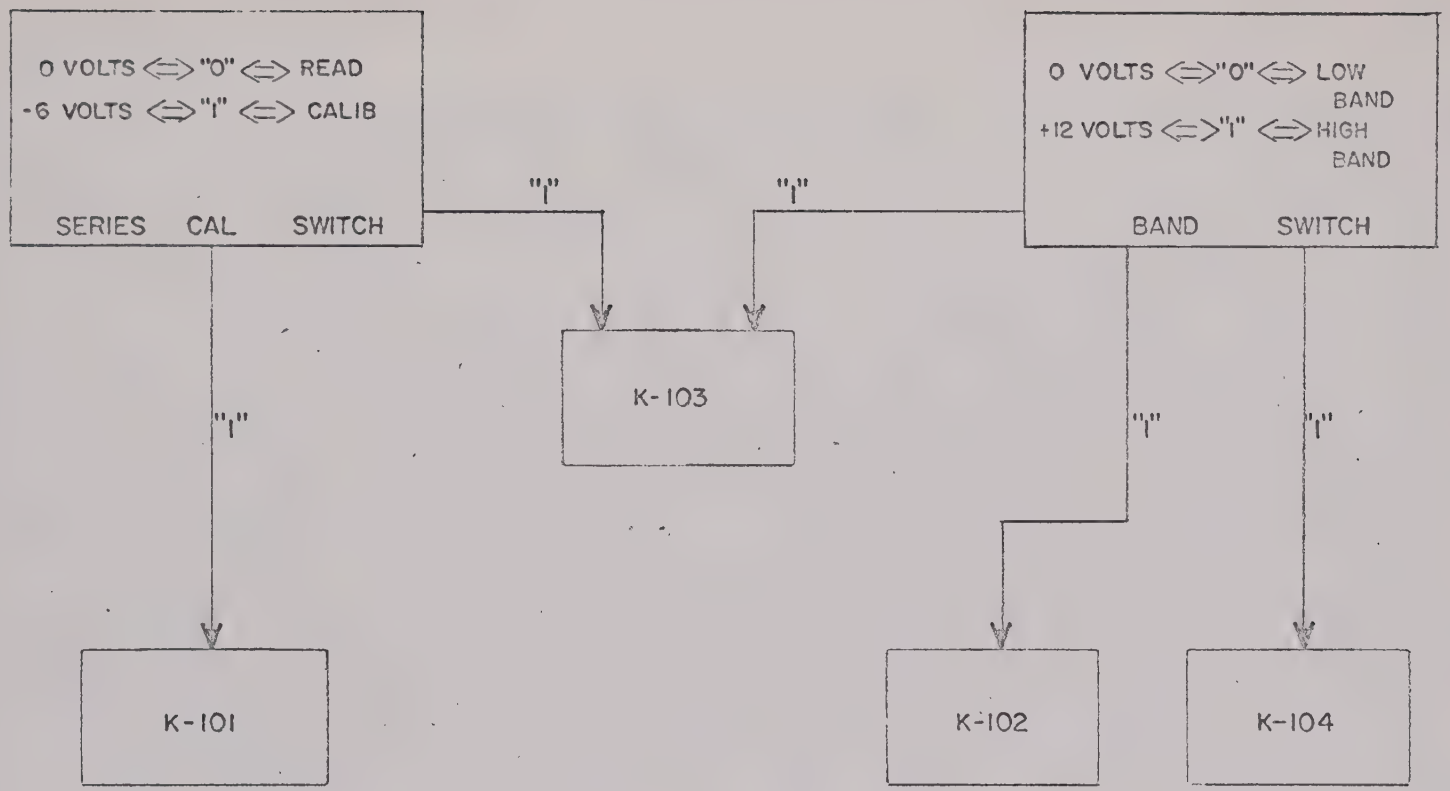


FIGURE 2-1 BLOCK DIAGRAM, Model RVA-25



"Numbers" between switches and relays describe logic that must be supplied to energize relays. Relay K-103 must receive a "1" logic from both switches before energizing.

FIGURE 2-3 LOGIC CONTROL DIAGRAM

de-energized relays K102 and K103. From Q_{10} the signal is capacitively coupled to Q_{17} for further amplification. The output of Q_{17} is coupled directly to Q_{18}, an emitter follower output stage which provides the output impedance of 50 ohms. Negative feedback is provided between Q_{18} and Q_{10} to increase the input impedance of Q_{10} and for circuit stability.

2.2.2 READ MODE-HIGH BAND

For high band operation in the read mode, electric field signals are again intercepted by the 82" telescoping antenna, but, because relay K102 has been energized by the "1" logic voltage from the band indicator switch of the EMC-25, they are coupled through K103 into the base of Q_9, bypassing the first two amplifier stages. The input impedance of approximately 150K ohms provides optimum loading for the rod antenna in the 2.4 - 25 MHz frequency range. From Q_9 to the RF output, the signal path is the same as it is for low band operation in the read mode.

2.3 CALIBRATION MODE

To switch from the read mode to the calibration mode, the "Series Cal" button on the EMC-25 is depressed. Depressing this switch furnishes the "1" logic to energize relay K101 which disconnects the rod antenna in the RVA-25. The RVA-25 is also fed binary logic for either low "0" or high "1" band from the band indicator switch, which controls relays K102, K103 and K104.

2.3.1 CALIBRATION MODE-LOW BAND

If the EMC-25 is feeding "0" logic from the band indicator switch, relays K102, K103 and K104 will be de-energized and the RVA-25 will be in the low band with the calibration signal coupled through two pi-section lowpass filters (L8, C18, C19 and L6, C9, C10) and through C8, a 22 pf. capacitor equivalent to the impedance of the vertical rod antenna.

The calibration signal then goes through energized relay K101 to the base of the source follower amplifier, Q_2, after which it travels the same path as does a signal in the low-band read mode.

2.3.2 CALIBRATION MODE-HIGH BAND

In the high calibration mode the EMC-25 feeds "1" logic from the band indicator switch to relays K102, K103 and K104, energizing them and changing the calibration signal path. In the high band calibration mode the calibration signal goes through a pi-section low-pass filter consisting of L8, C18, and C19 and then through energized relay K104 and through C17, a 22 pf. capacitor equivalent to the impedance of the antenna. The signal then goes through energized relay K103 into the base of emitter follower Q_9. From Q_9 the signal follows the same path as it does in the high-band read mode.

3.0 OPERATING INSTRUCTIONS

3.1 GENERAL

Before attempting to operate the RVA-25, the operating instructions for the EMC-25 should be read carefully and all necessary calibrations made on the EMC-25 itself.

3.2 PHYSICAL SETUP

First, mount the antenna base to the Tripod, Model TRP-25. The antenna base is secured to the tripod by screwing it in a clockwise direction, as viewed from above.

Next, slip counterpoise, Model GPA-25, over, and attach it to the top of the antenna base, screwing the four captivated thumb screws on the counterpoise into the threaded holes provided at the corners of the antenna base.

Finally, screw the rod onto its socket and extend to its full 82-inch length, electrically equivalent to 1 meter.

3.3 ELECTRICAL CONNECTIONS (See Fig. 3-1)

The 25-foot multiple-conductor cable furnished with the antenna is to be connected between the 9-pin connector on the antenna base and the 9-pin connector on the CJB-25 or SU-125. The 25-foot coaxial cable is to be connected from the "Signal Out" TNC connector on the antenna base (nearest the 9-pin connector) to the "RF Input" TNC connector on the EMC-25 front panel or an SU-125. The other TNC connector on the antenna base is for calibration and for use in the signal substitution method of measuring signals.

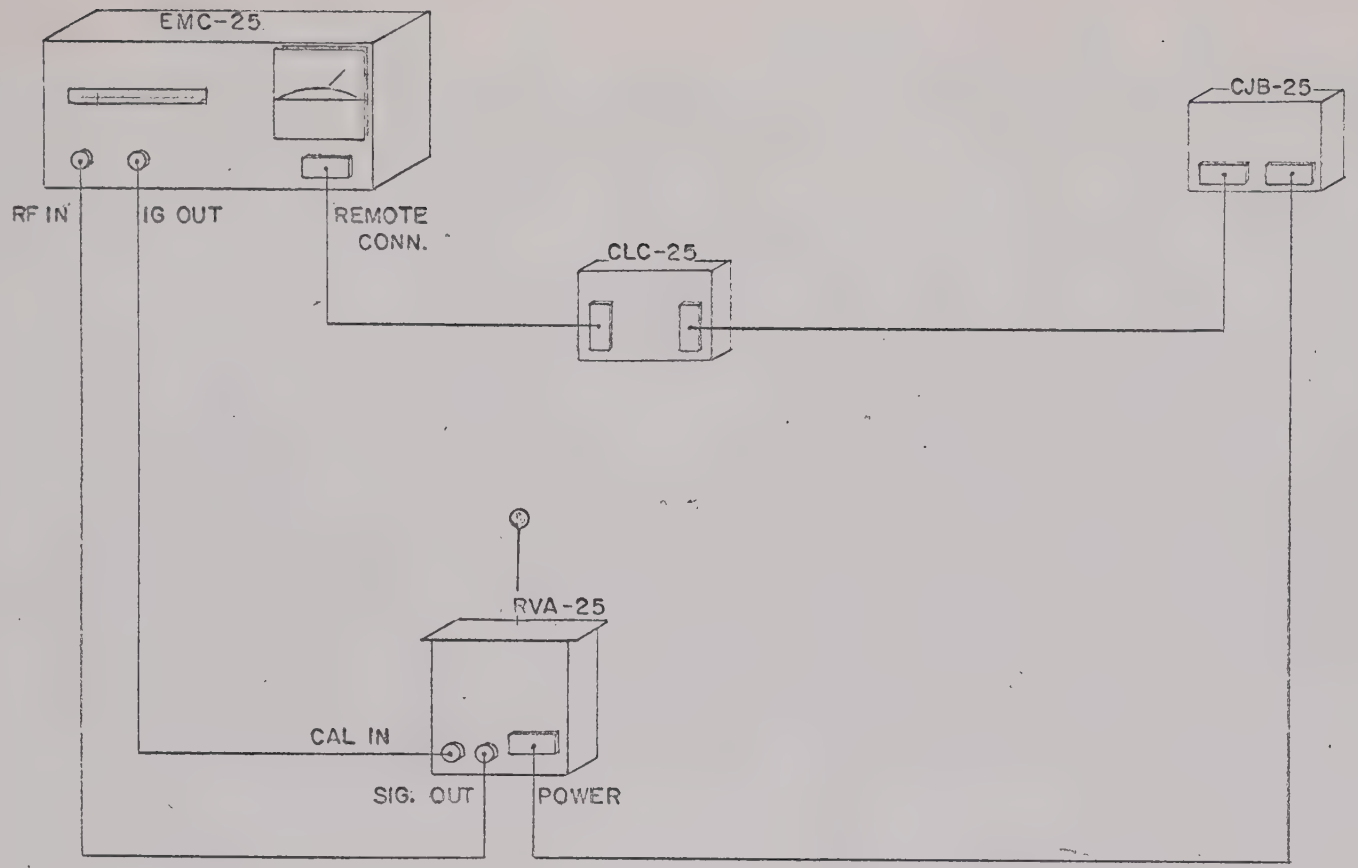


FIGURE 3-1 SYSTEM INTERCONNECTION

3.4 PRE-OPERATIONAL CHECK

Before continuing, the coaxial cable between the EMC-25 and RVA-25 should be disconnected at the EMC-25 and a relative noise level noted. Reconnect the cable and notice a rise in this noise level assuring that the RVA-25 and EMC-25 are operative.

Care should be taken so as not to overload the RVA-25 and the EMC-25. Only low-level signals should be measured; the RVA-25 is not intended for use in those applications where high levels of broadband interference must be accurately measured. Broadband interference levels greater than 25 dB above the internal noise of the RVA-25 should be measured using Remote Vertical Antenna, Model RVR-25, which is a passive device.

3.5 SPECIFICATIONS

FREQUENCY RANGE

Low Band (Bands #1-7) 14 kHz to 2.4 MHz

High Band (Bands #8-10) 2.4 MHz to 25 MHz

INPUT IMPEDANCE (NOMINAL)

	Low Band	High Band
Antenna Input	25 Meg.	150 K
Calibrate Input	50 ohms	50 ohms

OUTPUT IMPEDANCE (NOMINAL) 50 ohms

DYNAMIC RANGE (NOMINAL)

(Narrowband)	75 dB
(Broadband)	25 dB

SENSITIVITY

See chart, Figure 3-2.

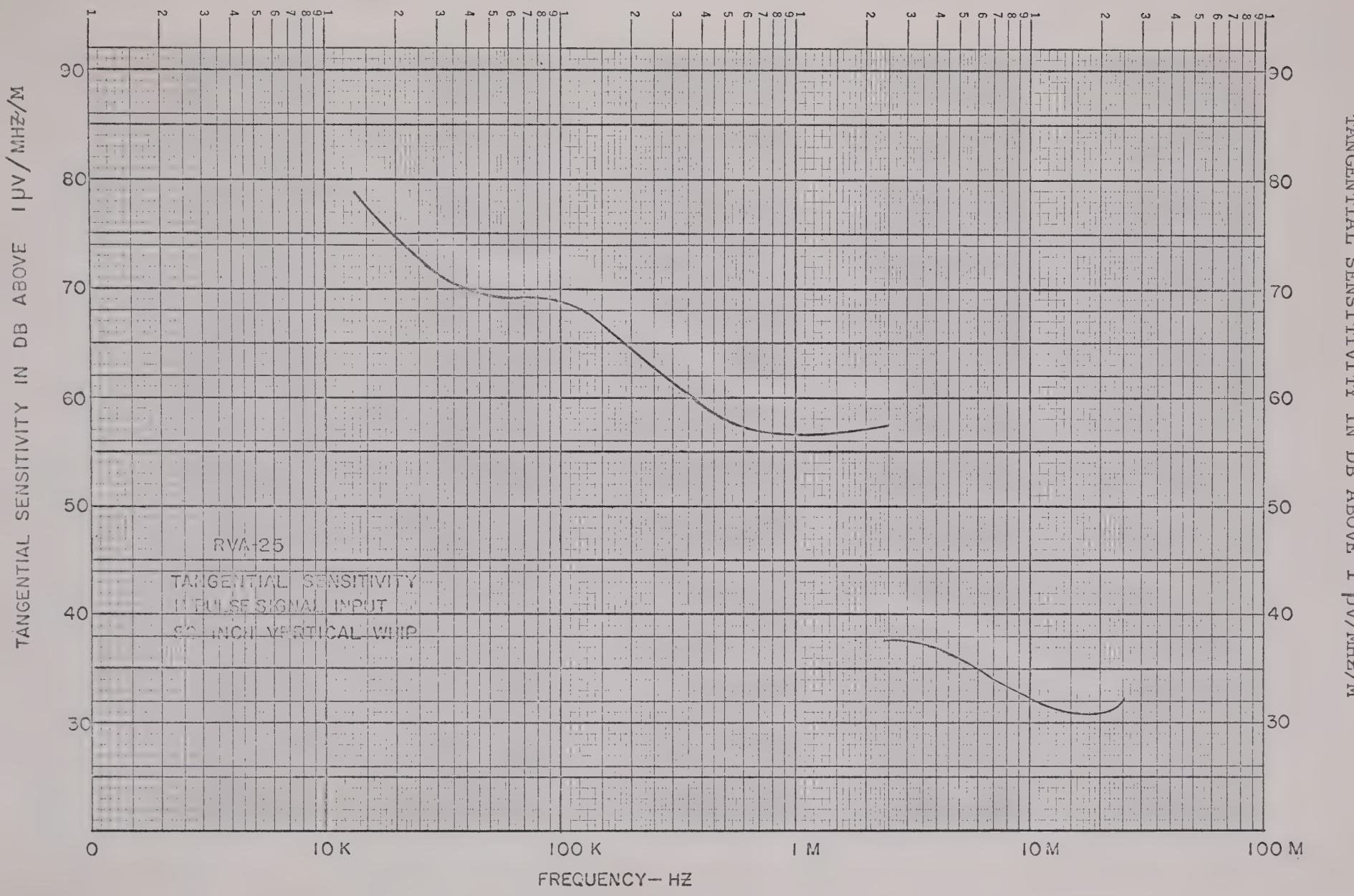


FIGURE 3-2 SENSITIVITY

3.6 ELECTRIC FIELD MEASUREMENTS

3.6.1 NARROWBAND RADIATED SIGNALS

Connect the Remote Vertical Antenna Model RVA-25 as described in Paragraph 3.3, and in addition, connect a calibrated signal generator to the calibration input TNC connector on the RVA-25. Tune the EMC-25 to the frequency range of interest and set a convenient level on the EMC-25 meter for the particular signal of interest and note this level. Next, depress the "SERIES CAL" button on the EMC-25; this disconnects the vertical element and substitutes the calibration input internally in the RVA-25. Without changing gain or attenuator settings on the EMC-25, set the generator output level at the same frequency to read exactly the same level just noted on the front panel meter of the EMC-25 and record the generator level in dB referenced to one uv (dBuV).

Antenna factor is 0 dB for the 82" rod, so the level determined is also that in dBuV/meter. For a 41" length rod, add an antenna factor of + 6dB.

3.6.2 BROADBAND RADIATED SIGNALS

Measurement of broadband signals requires the use of the Model CLC-25, Calibrator Level Control and the Model CJB-25, Control Junction Box, in addition to the RVA-25 and EMC-25. The system is interconnected as shown in Fig. 3-1. An external impulse generator may be used in lieu of the CLC-25 (See final paragraph, this section.)

First, determine if the signal being measured is truly a broadband signal (see Par. 3.14 of EMC-25 Instruction Manual).

82 INCH
ROD ANTENNA

Solid State

L2 330
L3 330
L4 330
L5 330

P1
J1

.001 EACH
C27 C26 C25 C24
L7
330

R3 120
R17 120
.001
C37

C4 15
C5 .01
C11 .15

C12 15 20V
C13 .01

C36 .001

+11.2V

C21 15 20V

L10
330

J6 CONTROL
P2
+ RAW
- RAW
0 or -6
CAL. COMMAND
8 BAND LOGIC
ACC-25B
ANTENNA
CONTROL
CABLE
GND
P1 TO CJB
A B C D E F G H I

L9 330

J2 P2
J3
SIG. OUT

C35

L11 330
L12 330
L13 330

R1 820K
R2 33K
C13 .15
Q1 S1578I
RD
K101
LO
K102
HI
K103
R4 18M
Q2 2N3277
R5 6.8
C2 .15
L1 330
C28 .001
CAL
C1 .15
CR1 IN3064
R6 2.2M
R7 12K
C6 15
C7 .01
R8 22K

CR2 1N3064
Q5 2N4250
R9 12K
R11 8.2K
R12 5.6K
Q3 2N3643
R10 680
Q4 2N4250
R13 470
Q6 2N3643
R14 470
Q7 2N3693
R15 12K
R14 6.8K

CR3 IN3064
Q8 2N4250
R21 1.2K
R29 12K
R27 8.2K
R28 5.6K
Q11 2N3693
CR4 IN3064
Q13 2N3643
R30 6.8K
Q12 2N4250
R31 470

R18 270K
R19 82K
Q9 S1578I
Q10 2N3563
R20 1K
C20 .01
Q17 2N3563
R38 47K
R39 1K
Q18 2N 3693
R40 47
C22 .15
R41 1.5K
C23 .15
R25 5.6
R26 470
C14 .15
C15 .15
R22 470K
R23 2.2K
R24 22K
C16 .001
R42 18K
R43 560
R44 680
R45 4250 1%
R47 8450 1%
Q19 S7956
R46 4.7K
Q20 S1578I
Q21 2N3693

C17 22PF
R32 51 5%
K104
L8 .47
C18 82 PF
C19 82 PF
J4 P4
J5
CAL. IN

C8 22PF
L6 3.3
R16 51 %
C9 .001
C10 .001

CR5 IN3064
Q15 2N4250
R33 8.2K
R34 1.2K
R35 5.6K
Q16 2N3693
Q14 2N 3643
R36 470
R37 12K
C33
C32
.001 EACH
C34

.001 EACH
C29
C30
C31

NOTES:
1. UNLESS OTHERWISE SPECIFIED, ALL COMPONENTS ARE AS FOLLOWS;
(a) RESISTIVE VALUES ARE IN OHMS, 1/4 W ±10%
(b) INDUCTIVE VALUES ARE IN MICROHENRIES ±10%
(c) CAPACITIVE VALUES ARE IN MICROFARADS ±10%
(d) MARKED * ARE FACTORY ADJUSTED, TYPICAL VALUES SHOWN
(e) RELAYS ARE SHOWN IN THE DE-ENERGIZED POSITION

voltage regulator

Schematic Diagram, Model RVA-25

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